SECTION 15075
DISINFECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes requirements for disinfection of new, modified, and repaired piping systems conveying potable water.

1.3 REFERENCES

A. American Water Works Association (AWWA):
   1. AWWA B300-92, Standard for Hypochlorites.
   2. AWWA B301-92, Standard for Liquid Chlorine.
   3. AWWA C651-92, Standards for Disinfecting Water Mains.
   4. AWWA Manual M12-97, Simplified Procedures for Water Examination.
   5. AWWA Manual M20-73, Water Chlorination Principles and Practices.
   6. Standard Methods for the Examination of Water and Wastewater (1984).

1.4 SUBMITTALS

A. Test Reports that indicate results comparative to specified requirements.

B. Certification that cleanliness of water system meets or exceeds specified requirements.

C. Disinfection Reports that indicate:
   1. Type and form of disinfectant used.
   2. Date, time, and locations of disinfectant injections or placement.
   3. Initial and 24-h chlorine concentrations (quantity in treated water) for each outlet tested.
   4. Date and time of flushing start and completion.
   5. Chlorine concentration after flushing for outlets tested.

   Contractor’s representative will prepare Bacteriological Reports that indicate:

   6. Issue date, project name, and testing laboratory name, address, and telephone number.
   7. Date, time, and location of water sample collection.
   8. Name of person collecting samples.
   9. Initial and 24-h chlorine concentrations for outlets tested.
   10. Coliform bacteria test results for outlets tested.
   11. Certification that water conforms, or fails to conform, to bacterial standards.
   12. Bacteriologist's signature and authority associated with testing.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Observe appropriate safety practices to protect workers and public from exposure to chlorine.

B. Store hypochlorites in cool, dry, dark environment to minimize deterioration.

C. Minimize duration of storage of disinfecting materials.

1.6 SEQUENCING

A. Disinfect new potable water piping before placing into service.

B. Disinfect portions of potable water piping systems taken out of service for inspection, repair, or other activity that could lead to contamination of water before returning to service.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Liquid Chlorine: AWWA B301, 100% available chlorine, packaged in steel containers.

B. Sodium Hypochlorite: AWWA B300, liquid form, 5% to 15% available chlorine, packaged in rubber-lined or plastic containers.

C. Calcium Hypochlorite: AWWA B300, granular or tablet form, approximately 65% available chlorine by weight.

PART 3 - EXECUTION

3.1 DISINFECTION PROCEDURES

A. General:
1. Ensure distribution of chlorinated water by bleeding water from outlets.
2. Dispose of heavily chlorinated water bled or flushed from system per Project Waste Management Plan (PWMP).
3. Test chlorine concentration at minimum 15% of system outlets.
4. Facilities Manager representative will test samples for bacteriological quality per *Standard Methods for the Examination of Water and Wastewater* and AWWA C651.
5. Collect samples minimum 16 h after final flushing.
6. Collect bacteriological samples from end of main and each branch.
7. Collect samples in sterile bottles treated with sodium thiosulfate per *Standard Methods for the Examination of Water and Wastewater*.

B. Tablet Method:
1. Maintain pipe and appurtenances in clean and dry condition during construction.
2. During construction, place calcium hypochlorite granules in pipe per Sect. 5.1.1 of AWWA C651.
3. During construction, place calcium hypochlorite tablets in each section of pipe, hydrants, hydrant branches, and appurtenances per Sect. 5.1.2 of AWWA C651.
4. Notify CM minimum 24 h prior to disinfection of system.
5. CM will notify Facilities Manager Industrial Hygiene Department that bacteriological testing of system can begin in 48 h.
6. Fill system with potable water supplied from temporary connection including approved backflow prevention device.
7. Take initial chlorine samples.
8. After 24 h, take final chlorine samples. If measured chlorine level of final sample is below 24 mg/L, redisinfect system using Continuous-Feed or Slug Method.
9. Flush system with potable water until measured chlorine level is between 0.2 mg/L and 1.2 mg/L.
10. Facilities Manager Industrial Hygiene Department will take bacteriological samples.

11. If final bacteriological samples show presence of coliform organisms, redisinfect system using Continuous-Feed Method.

C. Continuous-Feed Method:
1. Maintain pipe and appurtenances in clean and dry condition during construction.
2. During construction, place calcium hypochlorite granules in pipe per Sect. 5.2.1 of AWWA C651 (optional).
3. During construction, place calcium hypochlorite tablets in each section of pipe, hydrants, hydrant branches, and appurtenances per AWWA C651 (optional).
4. Notify CM minimum 24 h prior to disinfection of system.
5. Fill system with potable water supplied from temporary connection including approved backflow prevention device.
6. Flush system with potable water with velocity of minimum 2.5 ft/s [unless otherwise specified by CM].
7. Pressure/leak test system. If repair of a leak requires cutting into or opening of main, redisinfect piping in location of leak per Sect. 10 of AWWA C651, if optional steps were completed.
8. After mains have passed pressure test, notify CM minimum 24 h prior to continuing disinfection of system.
9. CM will notify Facilities Manager Industrial Hygiene Department that bacteriological testing of system can begin in 48 h.
10. Inject heavily chlorinated water into mains until entire main is filled with water having chlorine dose of minimum 25 mg/L free chlorine.
11. Take initial chlorine samples.
12. After 24 h, take final chlorine samples. If measured chlorine level of final sample is below 10 mg/L, redisinfect system using Continuous-Feed Method.
13. Flush system with potable water until measured chlorine level is between 0.2 mg/L and 1.2 mg/L.
14. Facilities Manager Industrial Hygiene Department will take bacteriological samples.
15. If final bacteriological samples show presence of coliform organisms, redisinfect system using Continuous-Feed Method.

D. Slug Method:
1. Maintain pipe and appurtenances in clean and dry condition during construction.
2. During construction, place calcium hypochlorite tablets in each section of pipe, hydrants, hydrant branches, and appurtenances per AWWA C651 (optional).
3. Fill system with potable water supplied from temporary connection including approved backflow prevention device.
4. Flush system with potable water with velocity of minimum 2.5 ft/s [unless otherwise specified by CM].
5. Pressure/leak test system. If repair of a leak requires cutting into or opening of main, redisinfect piping in location of leak per Sect. 10 of AWWA C651.
6. After mains have passed pressure test, notify CM minimum 24 h prior to continuing disinfection of system.
7. CM will notify Facilities Manager Industrial Hygiene Department that bacteriological testing of system can begin in 24 h.
8. Inject water after having chlorine dose of minimum 100 mg/L free chlorine into mains.
9. Take chlorine samples along path of chlorine slug as it travels through mains. If measured chlorine dose falls below 50 mg/L, reposition chlorination equipment per Sect. 5.3 of AWWA C651.
10. Take final chlorine samples 3 h after chlorination. If measured chlorine level is less than 100 mg/L, redisinfect system using Continuous-Feed Method.
11. Flush system with potable water until measured chlorine level is between 0.2 mg/L and 1.2 mg/L.
12. Facilities Manager Industrial Hygiene Department will take bacteriological samples.

13. If final bacteriological samples show presence of coliform organisms, redisinfect system using Continuous-Feed Method.

E. Conclusion:
1. Make final connections to existing potable water mains per Sect. 9 of AWWA C651.
2. Replace permanent system devices removed for disinfection activities.
3. Pressure/leak test system. If repair of a leak requires cutting into or opening of main, redisinfect piping in location of leak per Sect. 10 of AWWA C651 [Tablet Method only].

3.2 FIELD QUALITY CONTROL

A. Perform disinfection activities in presence of CM.

B. Provide Facilities Manager with the option of witnessing disinfection activities.

C. Chlorine content of water will be checked by CM after completion of disinfection activities.

3.3 PROTECTION

A. Ensure that disinfected piping is protected from contamination by covering exposed ends.

END OF SECTION 15075